

Spatially Coherent Ultrafast Soft X-ray Generated by HHG in a Hollow Fiber

Yanwei Liu, David Attwood

Center for X-ray Optics, Lawrence Berkeley National Laboratory, Berkeley, CA 94720
and

Randy Bartels, Ariel Paul, Henry Kapteyn, Margaret Murnane, Sterling Backus
JILA, University of Colorado, Boulder, CO 80309

The spatial coherence of the radiation from a light source is critical for many of its potential applications. High harmonic generation (HHG) is a promising method for generating ultrafast and coherent radiation throughout the ultraviolet and extreme ultraviolet (EUV) to soft x-ray regions, due to its nature of coherent excitation by femtosecond laser. However, in previous experiments on HHG sources, the full coherence of the fundamental driving beam was not well retained. In this paper, we show that EUV radiation generated in a hollow core fiber has nearly perfect spatial coherence. This result took advantage of the selective phase-matching associated with the guided pump field inside the fiber waveguide, thus reduced the inherent limitation on spatial coherence of HHG due to the intensity- and space-dependent phase factor.